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To: Michael H. Samples, *de maximis, inc.*

From: Leah K. Werner, EPA

Subject: EPA Comments Related to Groundwater and Operable Unit Designation Changes from Review of the *Draft Feasibility Study Report* dated June 9, 2021, Gary Development Landfill Superfund Site, Gary, Indiana

Date: October 27, 2022

1. Introduction

The U.S. Environmental Protection Agency (USEPA) has reviewed the document prepared by Weaver Consultants Group (Weaver) entitled: *Gary Development Landfill* (GDL or the Site) *Superfund Site Feasibility Study Report* dated June 9, 2021. USEPA disapproves the Feasibility Study (FS) report's conclusions relating to groundwater and is providing this memorandum to document inadequacies related to the groundwater discussion in the Remedial Investigation/Feasibility Study (RI/FS) to date, the need for additional groundwater characterization, the rationale for operable unit (OU) designation changes, and a path forward. The discussion below outlines specific concerns. This site strategy adjustment will expedite the source area landfill [Operable Unit 2 (OU2)] Record of Decision (ROD) while being able to address groundwater data deficiencies under OU3.

2. FS Deficiencies Related to Groundwater

2.1 Appropriateness of the MNA Remedial Alternative

The FS report does not provide adequate evidence of plume stability or a natural attenuation for nearly all contaminants of concern (COC). For example, 1,4-dioxane is identified as a COC under all exposure scenarios (not just drinking water). No preliminary remedial goal (PRG) for this chemical is proposed for groundwater in the FS. If monitored natural attenuation (MNA) were to be an appropriate remedy for 1,4-dioxane, plume stability and a mechanism for attenuation must be demonstrated, as per OSWER Directive 9200.4-17 [1997], (which is accurately cited, but incorrectly applied in the FS report). While the FS report states there is no evidence of plume expansion (see Sections 4.2.1.1 and 4.4.2), it is unclear what data were used to draw this conclusion. For most wells, only one round of data for 1,4-dioxane was provided in the RI report. For the wells which have multiple rounds of data, a clear and meaningful downward trend in concentrations is not observed. For example, MW06S has two rounds of data available in July and October 2017, but there was an apparent increase in 1,4-dioxane from 760 micrograms per liter ($\mu\text{g/L}$) to 2000 $\mu\text{g/L}$ between the two events. There is not a monitoring well present to the east or north of this location to bound the plume and demonstrate stability.

No mechanism is provided for how reductions in concentrations of 1,4-dioxane can occur in the future. The FS report does not include a remediation timeframe estimate for MNA, yet Section 4.2.1.5 of the FS report states that “the estimated remediation period is acceptable.”

Groundwater contamination is present within the perimeter of the existing on-site monitoring wells and no monitoring wells outside the landfill boundary are present to accurately depict any COC plume. Section 4.2.1.1 of the FS report states that “there are no apparent COC plumes migrating off-site based on the fact that groundwater impacts are generally localized and not widespread.” However, 1,4-dioxane was detected above screening levels in every monitoring well. Further, as 1,4-dioxane typically migrates ahead of other contaminants, the presence of 1,4-dioxane in all monitoring wells suggests that additional COCs may be migrating or will migrate outside the landfill boundary in the future.

The FS report does not provide adequate evidence of plume stability or natural attenuation for nearly all COCs, and some chemicals are less likely to degrade at all. The results of the RI show high concentrations of benzene and per- and polyfluoroalkyl substances (PFAS) near the edge of the property in MW08S, and that the levels appear to be increasing over time in some monitoring wells (Parsons, 2020a; Parsons, 2020b; USEPA, 2021). Additionally, while a mechanism is provided for attenuation of the polycyclic aromatic hydrocarbons (PAHs), it is unclear if aerobic degradation would occur under the changed conditions in the landfill if a landfill cap limits future water infiltration. While there is some evidence of aerobic conditions now, those may not persist if a landfill cap remedy is implemented. Note that methane generation in the landfill makes it unlikely that aerobic conditions are present throughout the landfill, even under current conditions.

A wide range of dissolved oxygen (DO) and oxidation-reduction potential (ORP) values were recorded from the groundwater monitoring wells, indicating both reducing and oxidizing processes may be occurring at the Site. However, specific COCs require specific conditions for effective MNA. Plumes of specific COCs and the geochemical conditions present within those plumes need to be evaluated for each COC prior to selection of MNA as a remedy. As MNA is not a remedy that will control off-site migration of contaminated groundwater as required by the presumptive remedy guidance (USEPA, 1993), it’s applicability at this time is not appropriate. Additional monitoring and evaluation are required to determine whether MNA is appropriate for each COC.

2.2 Source Area Groundwater Control and Leachate Collection Requirement

The presumptive remedy guidance states that source area groundwater control and leachate collection and treatment are required to be evaluated as alternative components for the presumptive remedy (USEPA, 1993). In General Comment 1 of USEPA’s November 30, 2020, review letter on the FS report prepared by Parsons in July 2020, USEPA noted that the components identified in Highlight 1 of the presumptive remedy are required for use of the containment presumptive remedy approach. USEPA further noted that two of the components in Highlight 1 of the presumptive remedy, 1) source area groundwater control to contain plume and 2) leachate collection and treatment, are not included in any of the proposed remedial alternatives evaluated for the landfill area in the FS report prepared by Parsons in July 2020 for the GDL Site. On June 9, 2021, Weaver responded that the remedial alternative components for

groundwater containment and leachate collection and treatment are discussed in Section 4.3 of the FS report (Weaver, 2021). However, Section 4.3 of the FS report does not discuss remedial alternative components. Additionally, Section 4.4.2 (Source Area Groundwater Control to Contain the Plume) states “Extraction and treatment of groundwater/leachate is not warranted to control off-site migration of wastes at the site. No alternative specific to groundwater control was evaluated.” Furthermore, Section 4.4.3, Leachate Collection and Treatment, also states “Extraction and treatment of groundwater/leachate is not warranted to control off-site migration of wastes at the site. This component was not retained.”

The assertion that source area groundwater control and leachate collection and treatment are “not warranted” at the Site is not demonstrated in the FS report. Section 4.4.3 of the FS report states, “Results of the RI (Parsons, 2019a) demonstrate that leachate was not identified and therefore not migrating beyond the limits of the waste.” However, a Hazard Ranking System (HRS) Evaluation conducted in March 2011 indicates that leachate waters were discharged to into the southern wetland. Waste within the landfill lies below the water table and there’s no planned approach for preventing leaching from the submerged waste. Source area groundwater control and leachate collection measures are justified as part of a presumptive remedy if existing information clearly shows that the waste in the landfill has contaminated other media and is a potential threat to human health or the environment. Measures to control landfill leachate, affected groundwater at the perimeter of the landfill and/or upgradient groundwater that is causing saturation of the landfill mass must be evaluated as remedial alternatives as part of the presumptive remedy in the FS report.

Section 2.5.2 of the FS report posits that “the surficial material is underlain by a glacial till, which acts as a confining layer to minimize vertical downward migration between the surficial sand unit and the underlying bedrock.” However, the glacial till unit thickness has not been verified and its geotechnical properties are unknown. Therefore, it is unclear whether vertical migration of COC has occurred or may occur in the future. Verification of the glacial till layer thickness and geotechnical properties must be performed prior to any groundwater source control remedial measures.

2.3 Preliminary Remediation Goals and Comparison of Remedial Alternatives for Groundwater

While the FS report includes groundwater-specific remedy elements, the FS process appears to be incomplete with respect to groundwater. COCs requiring action are not clearly defined. COCs are listed for groundwater in Table 2-1 of the FS. However, the FS report text implies that only COCs posing risk under the construction worker scenario warrant action (cyanide, 1,4-dioxane, and PAHs). If this is the case, the text needs to be made clear on why this is the only exposure scenario evaluated.

PRGs are not specified for each groundwater COC requiring action, and no discussion of the ability of the remedial alternatives to achieve PRGs within a reasonable timeframe for each groundwater COC is provided. Based on the guidance cited above, a presumptive remedy does not obviate the need to provide a standard FS-level remedy evaluation for groundwater outside the landfill boundary with multiple alternatives evaluated and compared using the nine-criteria analysis process.

Additionally, while the RI report states that drinking water wells are not found in a 1-mile radius of the Site, one water well is located 1,350 feet to the south of the Site, across the river. The use of the well is identified as “home”, though the report states that the well is assumed to be non-potable due to its shallow depth (Parsons, 2019a, see Section 3.3 and Appendix C). It does not appear that the use of this well has been verified with the owner. There is no discussion in the FS report about potential future receptors from future well installation in the area. A discussion of land use controls or administrative measures should be included for future risk scenarios. The FS report should also reference to the City of Gary July 2006 ordinance (Ordinance No. 7930), which prohibits new potable water supply wells and requires connection to the City’s piped water supply, if it is available. The ordinance is effective within the City of Gary limits. Where a potable water supply from the City is not available, existing wells require testing and must meet the USEPA drinking water standards.

2.4 PFAS Considerations

Section 2.4.2 of the FS report states that despite PFOA and PFOS concentrations being detected above the USEPA’s PFOA and PFOS Lifetime Drinking Water Health Advisory level of 70 nanograms per liter (ng/L) (USEPA, 2019), “this screening value is a health advisory only” and “PFOA and PFOS are not considered a COC for the GDL Site.” Language indicating that PFOA and PFOS are not COCs must be removed from the FS report.

On May 18, 2022, EPA published Regional Screening Levels (RSLs) and Regional Removal Management Levels (RMLs) for five PFAS substances (USEPA, 2022). The EPA Memo “Interim Recommendations for Addressing Groundwater Contaminated with PFOA and PFOS” (USEPA, 2019) recommends using a target hazard quotient (THQ) of 0.1 screening non-cancer effects of PFOA and/or PFOS at sites where more than one contaminant is present. PFOA and PFOS were detected at concentrations at GDL well above their respective RSLs. PFOA was reported in groundwater samples at the Site at concentrations ranging from 110 to 880 ng/L, exceeding the RSL (THQ = 0.1) of 6 ng/L, and PFOS was reported at concentrations ranging from 94 to 220 ng/L (USEPA, 2020), exceeding the RSL (THQ = 0.1) of 4 ng/L. Additional characterization of PFAS and future response actions may be required.

2.5 Rationale for Supplemental Source Area Groundwater Investigation

During USEPA’s review of the FS report, a number of concerns were identified related to the ability of the remedial alternatives to address risks associated with chemicals determined to be present in source area groundwater. Deficiencies of the FS report are summarized as follows:

- Components of the presumptive remedy, including source area groundwater control to contain the plume and leachate collection and treatment, are not included as remedial alternatives in the FS report (USEPA, 1993).
- The FS report lacks defined PRGs and associated clean up goals for groundwater.
- The FS report lacks a remedy evaluation and selection process specific to groundwater.
- The FS report does not demonstrate that the proposed MNA approach will be effective on groundwater contaminants.
- There is no discussion of land use controls or administrative measures for future risk scenarios.

Overall, characterization of groundwater within the source area appears to be incomplete. In accordance with the Administrative Settlement Agreement and Order on Consent (ASAOC) for Remedial Investigation/Feasibility Study, effective May 12, 2014, paragraph 29.c., USEPA has identified the need for a supplemental source area groundwater investigation, in addition to the tasks defined in the initially approved RI/FS Planning Documents, to accomplish the objectives of the RI/FS as set forth in the SOW for this RI/FS. The source area investigation and groundwater monitoring will evaluate the following:

1. Leachate collection and source area groundwater control remedial alternatives;
2. Potential for off-site migration;
3. Pre- and post-cap conditions;
4. Update the site-specific conceptual site model (CSM);
5. PFAS impacts;
6. Develop site-specific PRGs; and,
7. Evaluate MNA parameters.

The findings will be used to evaluate source area groundwater remedial alternatives following the OU2 presumptive remedy remedial action, cap installation.

2.6 Rationale for Supplemental Groundwater Investigation Outside the Source Area

According to the presumptive remedy guidance (USEPA, 1993), “the presumptive remedy does not address exposure pathways outside the source area (landfill), nor does it include the long-term groundwater response action. Additional RI/FS activities, including a risk assessment, will need to be performed, as appropriate, to address those exposure pathways outside the source area. It is expected that RI/FS activities addressing exposure pathways outside the source generally will be conducted concurrently with the streamlined RI/FS for the landfill source presumptive remedy. A response action for exposure pathways outside the source (if any) may be selected together with the presumptive remedy (thereby developing a comprehensive site response), or as an operable unit, separate from the presumptive remedy.”

Chemicals have been detected at concentrations posing potentially unacceptable risks to human health in samples from groundwater monitoring wells along the perimeter of the landfill waste boundary, and no wells have been sampled beyond the property boundary (Parsons, 2019a, see Section 4 Figures). As a result, the extent of these chemicals is not defined. This lack of delineation results in an inability to assess all potentially impacted receptors and to establish clean up goals based on reasonably anticipated exposure pathways. Groundwater remedial alternatives should be compared in consideration of their potential to achieve clean up goals across the entire plume extent, which is currently unknown.

The lack of delineation also prevents the assessment of non-site related sources of chemicals either migrating onto the site or commingling with the site. Dewatering activities conducted in the 1970s and 1980s created an inward groundwater gradient toward the Site (Parsons, 2019a). As a result, some of the constituents detected in groundwater wells associated with the landfill may be from other sources or commingled with other sources. As an example, benzene, toluene, ethylbenzene, and total xylenes (BTEX) and PFAS detected in groundwater are present at the

highest concentrations along the northeast perimeter of the landfill, close to Gary Chicago International Airport. A clear understanding of the conceptual site model is important in assessing remedies as even the construction of a cap could result in a shift in groundwater flow.

Based on the presence of COCs at concentrations above the IDEM RCG Residential Tap Water Screening Levels noted in monitoring wells at the downgradient landfill boundaries, as well as the lack of groundwater data collected outside of the landfill waste boundary, there is potential for groundwater contaminants to have migrated (and to continue to migrate) outside the landfill waste boundary. Additional investigation into the potential for contaminated groundwater to have migrated outside the landfill waste boundary may be required to be protective of human health and the environment as well as to demonstrate plume stability to support the MNA approach for some COCs. In accordance with the presumptive remedy, the response action for exposure pathways outside the source, such as groundwater migration outside the source area, may be completed separate from the presumptive remedy.

The RI report concluded that the indoor air vapor intrusion (VI) pathway is incomplete. There are no occupied buildings on-site and building on a landfill cap in the future may be restricted through an environmental covenant or similar institutional control. The nearest buildings are commercial/industrial use approximately 400 feet to the west (recycling facility) and approximately 850 feet to the northeast (airport). However, according to the RI report, groundwater is shallow, precluding a significant vadose zone, and groundwater flow is expected to turn to the south after leaving the property boundaries on both the east and the west sides of the Site.

All properties are on public water in the area of the Site. Accordingly, additional source area groundwater monitoring will be performed pre- and post-cap construction. Following groundwater monitoring post-cap construction, a supplemental groundwater investigation outside of the landfill waste boundary may be required to complete delineation of the contaminated groundwater plume and adequately evaluate a groundwater remedy, pursuant to paragraph 29.c of the ASAOC.

3. OU Designation Changes and Path Forward

3.1 OU Designation Changes

USEPA will administratively “move” groundwater into a separate OU (OU3). The sitewide OU will be addressed in OU1 and the source area excluding groundwater will be addressed in OU2. The definitions of the OUs are as follows:

Operable Unit 1: OU1 is the sitewide OU. OU1 will be used exclusively for the remaining site RI activities and will not be used following approval of the final RI addendum.

Operable Unit 2: OU2 is the source area (landfill) OU and will be addressed by the presumptive remedy approach. OU1 now includes all other impacted site media (landfill contents, soil vapor, sediment, soil, surface water, and fish tissue), excluding groundwater.

Operable Unit 3: OU3 is considered the groundwater OU for the Site and is defined as all groundwater impacted by the Site. OU3 will include contaminated groundwater within the source area previously discussed under OU2 as well as contaminated groundwater outside the GDL landfill waste boundary associated with the Site (if any), to address the full extent of the contaminated groundwater plume.

Due to the more extensive data collection efforts anticipated for OU3, OU2 and OU3 will require separate FS reports and separate RODs. Following the supplemental source area investigation scheduled for early 2023, the FS report dated June 9, 2021, will undergo revision under OU2 and will require removal of the discussion of groundwater remedial alternatives. A remedial action will be evaluated and selected in a final OU2 ROD.

A supplemental source area investigation will be implemented during early 2023 and will include NAPL delineation and installation and sampling of new monitoring wells. Following the supplemental source area investigation, the source area wells will be monitored for eight consecutive quarters, followed by biannual groundwater monitoring through cap installation, and for eight quarters post-cap installation. The groundwater monitoring data will be reviewed and a separate supplemental groundwater investigation and risk assessment outside the landfill waste boundary, i.e., an off-site groundwater investigation, may be performed concurrent to the post-cap source area groundwater monitoring if deemed appropriate. A separate risk assessment and a separate FS report evaluating groundwater remedial alternatives will be prepared for OU3, and a remedy will be selected in a final OU3 ROD. Should site conditions change or the pre-cap groundwater monitoring data indicate unacceptable risk to human health or the environment, the site strategy will be re-evaluated and groundwater investigation and evaluation of a groundwater remedy may be expedited regardless of the status of cap construction.

3.2 Schedule for Work and Deliverables

The deliverables and work proposed in Section 3.1 will be implemented in accordance with the following schedule:

DELIVERABLE/ACTIVITY	DUE DATE
OU1 Supplemental Source Area Investigation Work Plan, Sampling and Analysis Plan (SAP), and Quality Assurance Project Plan (QAPP)	Draft Supplemental Source Area Investigation Work Plan and Sampling and Analysis Plan Addendum due no later than November 18, 2022. Final Supplemental Source Area Investigation Work Plan, SAP, and QAPP due 30 calendar days after receipt of USEPA's notification of deficiencies pursuant to Section 2 of the RI/FS AOC SOW and Section X of the AOC.
OU1 Supplemental Source Area Investigation (including well installation, NAPL delineation, and groundwater sampling)	Mobilize field effort within 45 days of receipt of approval of the Supplemental Source Area Investigation Work Plan.

OU1 RI Addendum (supplemental NAPL delineation and initial supplemental groundwater sampling report)	<p>Due 45 calendar days following receipt of the last set of analytical data collected as part of the Supplemental Source Area Investigation Work Plan.</p> <p>Final RI Addendum due 30 calendar days after receipt of USEPA's notification of deficiencies pursuant to Section 2 of the RI/FS AOC SOW and Section X of the AOC.</p>
OU1 Groundwater monitoring	<p>Quarterly groundwater will be sampled within the source area for a total of eight quarterly events, starting with the supplemental source area investigation. Biannual groundwater sampling will be implemented following the eight quarterly events and will continue through the completion of cap construction.</p> <p>Following cap construction, groundwater will be sampled for eight quarterly events.</p> <p>Analytical results and technical communications to be included in the monthly Progress Reports.</p>
OU2 FS Report	<p>Draft Revised FS Report due 45 days following the approval of the OU-1 RI Addendum.</p> <p>Final FS Report due 30 calendar days after receipt of USEPA's notification of deficiencies pursuant to Section 2 of the RI/FS AOC SOW and Section X of the AOC.</p>

Following approval of the OU2 FS Report, a schedule for future deliverables for OU2 and OU3 will be evaluated.

4. Conclusion

The current FS and associated groundwater presumptive remedy do not adequately address groundwater contamination present at the GDL Superfund Site. The presumptive remedy process is not intended to address groundwater beyond the extent of waste and an FS specific to this medium is usually required at landfill sites. The OU2 FS report should remove evaluation of groundwater remedies. A separate OU3 FS report should be prepared to include the following revisions and additional information:

- Evaluation of leachate collection and treatment and groundwater source control remedial alternatives to contain groundwater within the source area and prevent migration outside of the landfill waste boundary;
- Removal of MNA as an alternative for source control groundwater remedy;

- Consistency of the number of COCs requiring action for groundwater throughout the report;
- Removal of language indicating PFOA and PFOS are not COCs;
- Development of PRGs associated with those COCs; and,
- A discussion of land use controls or administrative measures for future risk scenarios;

If an MNA alternative is to be considered for a final remedy for OU3, sufficient data must be available to demonstrate a clear and meaningful downward trend in concentrations, a demonstration of plume stability for each COC must be performed, and mechanisms through which each COC can naturally attenuate must be proposed. Unless additional existing data is forthcoming, further characterization would likely be required to support the MNA approach.

5. References

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Parsons. 2019b. *Remedial Action Objectives Technical Memorandum for the Gary Development Landfill Superfund Site*. June.

Parsons. 2019c. *Alternatives Screening Technical Memorandum for the Gary Development Landfill Superfund Site*. October.

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